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WEATHER MAPS AND EARLY SYNCHRONOUS METEOROLOGICAL OBSERVATIONS.

IN the United States *Monthly Weather Review* for May, 1897, there appears a letter of unique interest with respect to the above-mentioned subjects.

Prof. Henry, the Secretary of the Smithsonian Institution, being anxious to organise a meteorological service in the United States, wrote on June 5th, 1850, to Mr. Glaisher, enquiring what was being done in this country. Mr. Glaisher wrote a long reply, and that reply has been found among the Smithsonian archives by Prof. Cleveland Abbe, and printed in the above-mentioned *Weather Review.*

As we have here Mr. Glaisher's own statement at the very time when the work was being arranged, the letter is so important that we reprint it *verbatim,* and will add a few comments at the end.

MY DEAR SIR,—In reply to your letter of June 5 I beg to say that I shall have great pleasure in sending you copies of the forms I use in collecting meteorological observations, and the results of my experience are entirely at your service. In your letter you have not indicated the channel through which you wish the papers to be sent, and, therefore, I shall forward them through the Royal Society.

With the papers I shall send you will find a few copies of an address of a new Society, which myself with a few gentlemen have formed. It is under the presidency of S. C. Whitbread, Esq.

At the meeting of the council of this Society, held a few days since, I did myself the pleasure of reading the letter with which you have favored me, and it was resolved that a form for collecting observations, drawn up by myself, and now in the printer's hands, should be sent to you, and the council expressed a wish to co-operate with the Smithsonian Institution as far as possible. Hitherto, there has been no fund devoted to meteorology in England, and I have borne all the expenses, excepting that each gentleman has furnished himself with his instruments; government, however, has published the results in the reports of the Registrar General, some of which I send.

We hope now to collect much more information than I have hitherto done, and if the system adopted by you be similar to that adopted by us, their united results will be more valuable.

Among the forms sent you will find one very simple, and which is used daily at about 50 different railway stations at the hour of 9 a.m., Greenwich time. The different railway companies have agreed that the station masters shall take these observations, and that they shall be brought to London the same day, free of expense. The proprietors of a London newspaper, the *Daily News*, incur the expense of sending a messenger to the several railway termini at about 2 a.m., and all the returns thus collected are immediately printed, so that the weather of the day previous, at one time, all over the country and parts of Scotland are publicly known. On receiving the paper I lay all these returns on a map, using a long, narrow-headed arrow to indicate the direction of the wind, and other symbols for the other information, and thus daily I know the weather, direction of the wind, etc., the whole being exhibited to the eye. Several gentlemen, whose names you will see in a form headed "Simultaneous observations taken at 9 a.m.," have agreed to co-operate with me, and to take all the observations taken by the railway station masters, as well as others, with their full sets of instruments. It is believed by these arrangements, that very important information, with respect to the passage of storms in particular, will thus be collected. I have already more than one year's observations and daily maps in an unbroken series.

Previous to commencing these observations I visited every station, determined its meridian, fixed a compass card, and instructed the station master, remaining with him till I felt certain he would take the observations well.

The method I have adopted with respect to the observations of general phenomena is first to superintend the making of the instruments, then their selection. I determine their index errors by carefully examining and comparing every instrument with a standard. I visit the different locations in which they are placed, and examine the positions of the instruments themselves.

On receiving the returns I first examine every one by itself; second, I divide them into groups, including the observations from one known good observer, and then I compare every result in every return with the corresponding result in the standard return, taking into account difference of elevation, etc.; next, I form groups according to latitude, and another according to the longitude, by these means I usually detect any errors, and I believe very few escape. After this I proceed to their combinations, etc.

The British Meteorological Society intends in future having monthly returns, including every observation, and for which a form is now being set up, I shall, therefore, be more certain of the accuracy of the results.

I should be glad to have some arrangements made with the captains of steam vessels between America and England, thus connecting the observations taken in both countries, and I think this may ultimately be done.

I have the honour to be, Sir, with much respect and esteem,

Yours very truly,

JAMES GLAISHER.

13, *Dartmouth Terrace, Blackheath, Kent, July 8th*, 1850.

The sudden advent of a forgotten document like this, naturally induces reference to previous statements respecting the matters therein mentioned. The first paper with which comparison has to

be made is Mr. Symons's *History of English Meteorological Societies*;(1) in it no modification whatever is needed.

The next papers are, "*The first Daily Weather Map, sold in the Great Exhibition of* 1851;(2) "*The First Daily Weather Map*;(3) *Scientific Weather Forecasting.* (4) Here Mr. Glaisher's letter gives additional information, showing, as it does, that the first reports were not (as we supposed) telegraphed, but were sent by train. With that exception, there seems nothing in either article which requires modification; but perhaps it will tend to clearness if we state, in chronological order, the facts as regards the British Isles:—

1848.—In the latter part of this year, or the early part of 1849, Mr. Glaisher received from nearly all the railway companies a free pass over their lines. He provided himself with a supply of compass cards, and travelled over the country, teaching the railway clerks how to observe the weather. At the same time he visited many private observers and inspected their stations, because from the beginning of 1847 he had organized and contributed to the Registrar General's Reports the series of tables which he has continued to furnish for every subsequent quarter for fifty years!

With regard to this inspection of stations—Is there any record of its (1) proposal or (2) execution at an earlier date?

1849, June 14th.—First collection of reports from the railway termini by the *Daily News*, insertion in its issue of the weather table for the previous day at 13 stations, and preparation by Mr. Glaisher in MS. of the first current weather map.

1851.—Similar information collected by the Electric Telegraph Company, and on August 8th issue of the first printed Daily Weather Map.

1860, September 6th.—Issue, by Admiral FitzRoy, of first Daily Weather Report at the cost of the English Government.

1872, March 11th.—Issue of first Daily Weather Map at the cost of the English Government.

The letter is very remarkable considering its date—before Maury, and *a fortiori* before the Brussels Conference, or the appointment of FitzRoy, or Le Verrier's action in consequence of the Black Sea storm. One cannot help regretting that lack of funds prevented England from reaping the advantage of Mr. Glaisher's broad and correct views, and that we are therefore ten or twenty years behind where we might have been. But as regards Mr. Glaisher personally—the Nestor of meteorologists, as Prof. Abbe happily names him—it must be some little consolation to know that his early efforts are thoroughly appreciated on both sides of the Atlantic.

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(1) *Quar. Jour.* [*Roy.*] *Met. Soc.*, Vol. VII. (1881), pp. 65-98.
(2) *Met. Mag.*, XXXI. (1896), p. 113.
(3) *Met. Mag.*, XXXII. (1897), p. 33.
(4) *Science Progress, N.S.*, I. (1896), p. 1.

TRUE TIME.

WE have received, and reprint at once, the following circular. But for the signature, and for the fact that we can remember no table or book which gives the information desired, we should not have believed it possible that there was any difficulty in knowing, in London, what time was being indicated by the office clock of any telegraph station in the world. However, this information appears not to be forthcoming, and as Prof. Milne requires to be able to identify with certainty seismometric and telegraph cable disturbances all the world over, we are sure that his enquiry should receive all assistance possible. We are glad to hear that the Marquess of Salisbury has promised to forward some of the applications through the Foreign Office, so that they may receive proper attention. Possibly this revelation of ignorance may be one step onward towards the attainment of that evident *desideratum*, Universal Time.

BRITISH ASSOCIATION,
BURLINGTON HOUSE, LONDON, W.

SIR,—It is, I think, remarkable that there appears to be no publication which shows the corresponding value in Greenwich Mean Time, of the local time employed throughout the World.

Such a table is indispensable in order to determine accurately the instant of occurrence of earthquakes, sea waves, magnetic phenomena, the despatch of telegrams, and many other events, the sequence of which in absolute time has to be determined.

Although application has been made to the Royal Observatory at Greenwich, to the Royal Geographical Society, to the Central Telegraph Office in London, to the Offices of Cable Companies, and to other possible sources of information, very little has been obtained.

As a Secretary of the British Association Committee whose names are appended, I desire to publish in their forthcoming report a table showing the differences between Greenwich mean time as used in England and Scotland and that of the Civil Times used in various parts of the world.

By Civil Time I mean the time used by Railways, Telegraphs, and for ordinary public affairs.

If different times are used in various parts of your country, I trust that you will be able to give information relating to the same.

Feeling assured of the value of the table it is intended to compile, I sincerely trust that you will favour me with a full and explicit statement of the time generally employed in your country. If it is mean time, state the meridian; the observatory, or the place to which this refers; and also, as a check against any misunderstanding, please state distinctly the equivalent of December 1st, 9 a.m. G.M.T. in the local time, or times adopted in your own country.

I have the honour to remain, sir,
Your obedient servant,
JOHN MILNE.

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SUNLESS DAYS AND THE DAY-DISTRIBUTION OF SUNSHINE IN SUMMER.

How many sunless days have we in London in the year, the months, the seasons? I will try to answer this question, on the basis of twenty years' observations at Greenwich (1877-96).

By a "sunless day" is to be understood one giving no record in the Campbell-Stokes instrument, in which, as is known, a strip of millboard is charred by solar rays focussed by means of a glass globe.

The total of sunless days in those twenty years I find to be 1,849; giving an average of (say) 92 in a year. About one-fourth of our days are sunless. In winter, of course, there is a large preponderance. The monthly averages are as follows:

Jan.	17·9	April.....	3·7	July.....	1·7	Oct.	8·5
Feb.....	11·3	May.....	2·5	Aug.....	2·1	Nov.....	12·9
March	5·9	June.....	2·6	Sept.....	3·6	Dec.....	19·3

Thus, December has most, and July least. (It may here be noted that the month with most bright sunshine is May.) Spring has 12·1 sunless days; summer, 6·4; autumn, 25·0; winter, 48·5. In the series, summer, spring, autumn, winter, each of the last three has about twice as many sunless days as the season before it.

Consider next the numbers in years and half-years:—

	Sunless days in year.	Sunless days Apl.—Sep.	Sunless days Oct.—Mar.
1877.....	86	16	—
1878.....	84	7	67
1879.....	106	17	85
1880.....	78	14	67
1881.....	92	17	80
1882.....	84	9	69
1883.....	82	20	67
1884.....	92	18	71
1885.....	102	15	74
1886.....	104	19	93
1887.....	92	17	78
1888.....	98	23	83
1889.....	105	19	70
1890.....	97	14	81
1891.....	79	18	79
1892.....	98	14	71
1893.....	80	10	80
1894.....	97	27	64
1895.....	90	13	73
1896.....	103	22	86
Totals	1849	329	1438

The year with most sunless days in this period is 1879, then follow 1889, 1886, 1896, &c. On the other hand, 1880 comes lowest, then 1891, 1893, &c. The most sunless summer half is 1894; the most sunless winter half, 1885-86.

Let us now restrict our attention to the five months May to September, and consider how the 153 days of this period are to be distributed in respect of bright sunshine. The total days in those 20 summer seasons (3,060) are arranged in grades differing by one hour's bright sunshine (0 to 1, 1 to 2, &c., each grade including the lower, but not the upper limiting value). Thus we have the following table:—

Hours Sunshine.	Days in May—Sep. in 20 yrs.	Average.	Hours Sunshine.	Days in May—Sep. in 20 yrs.	Average.
0—1	609	30·4	9—10	167	8·3
1—2	258	12·9	10—11	147	7·3
2—3	261	13·0	11—12	115	5·7
3—4	225	11·2	12—13	100	5·0
4—5	253	12·6	13—14	76	3·8
5—6	221	11·0	14—15	8	·4
6—7	233	11·6	15—16	1	—
7—8	204	10·2			
8—9	182	9·1	Total	3060	(say) 153

It will be seen that the grade 0 to 1 stands high above the others. About 20 per cent. of those days have sunshine less than one hour, or none. On the other hand, about 14 per cent. have 10 hours, or more. There are eight cases (in those 20 years) of 14 to 15 hours' sunshine, and there is one (in 1887) over 15.

A. B. M.

SO-CALLED SULPHUR-RAINS.

AMONG the superstitions engendered by ignorance of the laws of meteorology we must include the "showers of sulphur." Without absolutely denying that the wind may be able to carry to great distances real sulphur coming from volcanoes, it is certain that the majority of such showers are due to quite another cause. At Bordeaux the phenomenon of the so-called sulphur shower is quite frequent; it is seen every year in April and May, chiefly with fine rain and west winds. Objects are covered by this rain with a very fine yellow powder, which collects in hollow places. This powder has no odour and is impalpable; but if it be examined with the microscope it may be shown to consist of kidney-shaped bodies swelled at both extremities. The origin of this yellow powder is not doubtful. Bordeaux is encompassed toward the south and west by vast pine forests. At the period of flowering the pollen is carried by the wind up to the clouds, whence it falls with the rain. The special form of the corpuscles collected is absolutely identical with that of grains of vegetable pollen.—*Revue Scientific.*

HIGH TEMPERATURE AT NIGHT, AUG. 4TH.

To the Editor of the Meteorological Magazine.

SIR,—Your *Met. Mag.* for September to hand. I can confirm the fact of the high night temperature. Here at the altitude of 1,148 ft., as in England, the highest minima occurred during the two nights of 4th to 6th of August: 4th-5th, 61°·4; 5th-6th, 61°·5.

They occur in the first decade of August, of which the daily mean temperature is 65°·8; whilst that of the third decade of July is 63°·7, and that of the second decade of August, 62°·6.

But these high minima fall far short of those of other years, as you may judge from my table of 12 years' observations:—

DATE.		Maximum of the day before.	Minimum.	Lowest Minimum in between.
		°	°	°
1886	July 20	87·1	66·4	46·9
	Aug. 30	74·5	66·4	
1887	July 30	85·5	66·2	48·0
	Aug. 6	83·7	65·7	
1888	July 22	73·8	60·8	46·0
	Aug. 10	80·8	69·6	
1889	July 10	83·1	63·0	46·9
	Aug. 4	76·1	59·7	
1890	July 31	80·1	64·6	50·9
	Aug. 9	77·2	61·0	
1891	July 17	72·3	58·6	46·4
	Aug. 14	71·1	60·1	
1892	July 30	80·4	61·3	45·7
	Aug. 17	90·9	72·1	
1893	July 20	77·4	61·5	46·4
	Aug. 16	83·1	68·4	
1894	July 23	81·7	65·1	46·9
	Aug. 24	72·7	62·6	
1895	July 25	78·1	66·6	48·7
	Aug. 21	81·0	66·2	
1896	July 20	76·1	62·1	45·3
	Aug. 15	71·2	54·7	
1897	July 24	74·5	59·7	50·7
	Aug. 5	81·7	61·5	

You will notice that the difference between the minimum and the maximum of the day before is very variable, from 20°·7 in July, 1886, to 8°·1 in August, 1886. I have even seen this difference to be only 1°·8 in the middle of summer: on August 23rd, 1894, the maximum was 62°·6, and the minimum of the next day, 60°·8.—Yours truly,

V. RAULIN.

Montfauçon (Meuse), Sept. 18th, 1897.

To the Editor of the Meteorological Magazine.

SIR,—Referring to the letter in your last issue by Mr. Sydney Wilson, and to your list of high minimum temperatures, I may add

that the minimum reading on August 5th at Malvern, 500 ft. above sea level, was 68°·6. The maximum of the 4th being 83°·8. The minimum readings throughout the month were so high, that it brought the mean to within 1°·7 of that of July, although the latter month was upon the whole far hotter.—Yours faithfully,

C. S. PRINGLE.

Weston-super-Mare, 18th Sept., 1897.

A THERMO-HYGROGRAPH-CARRYING KITE 10,016 FT. ABOVE SEA LEVEL.

WE have not been able to keep our readers fully informed as to the progress of kite work in the United States. Suffice it now to say that Mr. A. Lawrence Rotch has invoked the aid of a small steam engine to wind in his kites, and has sent us the cutting which we reprint below; and we think that in so doing we ought to congratulate him on his success in the experiment; as to that of the prediction, we know nothing:—

"BLUE HILL OBSERVATORY, Sept. 19th.—All kite records were broken here this afternoon when the topmost kite of seven, all of the Hargrave type, on four miles of wire, attained an altitude of 10,016 feet above the sea level, or 9386 feet above the summit of the hill.

"The first kites were sent up about noon, and the greatest height was reached at 4.17 p.m., but several of the kites were in the air for an hour after sunset.

"The day was particularly favourable for the flight, the air being clear, while at the surface the wind blew in strong puffs from the south. As the kites rose, however, they ran into a more westerly current, until just after the last one was sent up, the highest was almost at right angles to the lowest, causing the wire to make a long sweeping curve to the eastward.

"As usual, an aluminium box containing an instrument for recording pressure, temperature and humidity, was swung 130 feet below the topmost kite. It remained higher than a mile during five hours.

"At the highest point the thermometer recorded a temperature of 38°, while at the same time it was 63° at the surface of the earth.

"At a height of 4000 feet the relative humidity rose rapidly, but sank again at a mile, where it was quite low. At 7000 feet it again rose, and soon reached a point where there was almost complete saturation of the air. From there upwards the atmosphere became drier, until at the highest point there was scarcely any moisture recorded. At the ground the relative humidity all the afternoon was quite low.

"The entire flight was made without a mishap, the kites going up easily, and, after getting above the southerly wind, remaining very steady.

"It took the steam engine a little over two hours to reel in the four miles of wire, and the last kites reached the ground at 6.40 p.m.

"From observation obtained in the upper atmosphere it does not appear that any sudden change in the temperature is probable for a day or so, the decrease in the temperature with height being about the average."

TREES DAMAGED BY LIGHTNING.

DURING the TS in the N. of London on July 21st, a poplar in Clissold Park, Stoke Newington, was damaged in a rather unusual way. The tree, a large one, stood on the edge of a gravel walk; and a low (9 inch) rail of 1 inch iron, which divided the footpath from the adjoining grass (and which was supported for most of its length by dwarf iron posts) had been driven into the tree so as to support the extremity of the rail. There was, therefore, virtually a long horizontal conductor connected to earth at every 8 ft., ending in the tree. When the storm-cloud came near, there was an explosive discharge, *not* at the top of the tree, nor even at any of its branches, but from about six inches above where the rail entered, up to about 4 ft. 6 in. above the ground; there the outer rough bark was blown off for about 3 ft. high by 1 ft. broad; along the middle of this the inner soft bark had been grooved (as is often the case with poplars) and separated from the trunk of the tree. We did not see the tree for two days, and doubtless the edges had been touched, but we noticed one feature to which we desire to call special attention, so that others may see whether the fact we noticed is, or is not, exceptional. The frayed edges on one side of the groove were attached by their upper extremities, and those on the other side by their lower ones—not without exception, but probably six fragments out of seven followed this rule. Of course, this suggests the passage of two currents in opposite directions; we express no opinion, and make no assertions; we merely record what we saw, and ask all who see a tree which has been grooved by lightning, to examine the edges carefully, and report the result. It is, we think, not much use looking at oaks, as they seem to be generally burst asunder as by an internal explosion.

EXPERIMENTS TO DRIVE AWAY HAIL.

WE have heard often enough that loud and continued explosions produce rain, and the recollection of rain-making experiments based upon this apparent connection is still with us. Now comes a report from Mr. Germain, United States Consul at Zürich, on the prevention of hailstorms by the same means that have been used to encourage a downfall of rain. It appears that Mr. Albert Stiger, burgomaster of Windisch-Freistritz (Lower Steirmark, Austria), owns extensive vineyards situated on the southern slopes of the Bacher Mountains,

a locality often visited by destructive hailstorms. To protect his vines from hail, he decided to try the shooting or explosive system to scatter the clouds and drive away approaching hail or heavy rain storms. Six stations were therefore erected on the six most prominent summits surrounding the locality, and commanding a territory of about two miles in extent. These stations sheltered ten heavy mortars each. Upon the slightest indication of a storm the mortars were immediately manned and loaded with 120 grams of powder each—about $4\frac{1}{4}$ ounces—and shooting commenced simultaneously and continued regularly out of the sixty mortars until the clouds were scattered and the storm had blown over. These experiments were anxiously watched by the citizens of Windisch-Freistritz last summer. Threatening black clouds made their appearance over the summits of the Bacher Mountains; at a given signal all the mortars were fired off, and the continuous detonations in a few moments caused a sudden reaction in the movements of the clouds. It is said that the clouds opened up funnel-like, the mouth of the funnel began to rise in the form of consecutive rings, expanding gradually until all of the cloud scattered and entirely disappeared. There was no hail, or even a sudden downpour of rain. The same experience was gone through six times during the summer, and proved a successful preventive in each case. We await the views of Austrian meteorologists upon these experiments; meanwhile, rainmakers who have put their trust in explosions must hide their diminished heads before the rain-dispersers.—*Nature.*

SAND STORM ON THE NILE.

MERAWI, *Sept. 22nd.*

THE great heat of the last ten days, due to the prevalence of the south wind, culminated yesterday in a great storm. All the morning the sky had been unsettled, and finally the clouds gathered, the air became perfectly still, and the birds ceased singing. The heat was intolerable, it was impossible to remain in one's tent, and many of the force sought relief by bathing their heads in water.

Suddenly, about three o'clock in the afternoon, two distinct dust walls were seen approaching, one from the south and one from the east. At the same time the wind began sighing in the trees. In five minutes it had increased to a hurricane, the two walls of sand united, and came on straight towards the middle of the camp. The noise resembled the sound of a big drum, and this, together with the rushing wind, produced a tremendous and awe-inspiring roar. The sand made a peculiar sound, like the rending of cloth. For half-an-hour the storm continued with unabated fury. By the end of that time the eyes, nostrils and mouths of all in camp were full of sand. Tents were blown down, and the river was lashed into furious waves. So suffocating were the clouds of sand that in many cases acute nausea ensued, while everyone suffered extreme discomfort.

THE BRITISH ASSOCIATION AT TORONTO.

EVERYBODY has seen in the newspapers how heartily the British Association was welcomed in Britain beyond the Sea; we, therefore, need say nothing on that head.

As regards Meteorological papers and reports we have been favoured with some yards of newspaper cuttings, but we have not room to print them *in extenso*, and doubtless the important papers will be published in the volume of the Association, which we are glad to find is issued much more promptly than it used to be. In these circumstances, we think that the best plan is to quote the summary of the Meteorological work given by our American contemporary, *Science*.

In the meteorological department the following papers were read:—

John Hopkinson, "Monthly and Annual Rainfall at Ten Stations in the British Empire, 1877 to 1896." It appears doubtful, however, whether so limited a series of observations can be taken as representative of the pluviology of the Empire.

Dr. Van Rijckevorsel, on the "Temperature of Europe." From certain peculiar maxima and minima exhibited by the curves of daily temperature, he considers that the continent may be divided into two regions in which a different type of weather prevails.

Prof. R. F. Stupart (Director of the Meteorological Service of Canada), on the "Climatology of Canada."

F. Napier Denison on the "Great Lakes as a Sensitive Barometer." From a comparison of simultaneous records of changes of level in the Great Lakes and of smaller undulations in the atmospheric pressure by means of a sensitive barograph, the author concludes that the larger differences are due to difference of atmospheric pressure over the extremities of the lake, but may be greatly augmented by the action of the wind on the surface of the water. The smaller undulations appear to be due to atmospheric waves caused by currents in different strata travelling in opposite directions, as shown by Helmholtz.

Papers were also contributed by A. Lawrence Rotch and by Prof. Marvin, on the "Exploration of the Air by Kites," showing how it was possible, by means of recording instruments sent up to great elevations attached to a kite, to obtain information with regard to the temperature and hygrometric condition of the air, which would be of use in forecasting. It appears, however, that there is still much to be done in improving the recording hygrometer.

There seem to have been also the following other papers which (perhaps intentionally) the reporter for *Science* ignores; we add the titles without comment.

DR. J. EDKINS.—Slow Refrigeration of the Chinese Climate.

R. G. HALIBURTON.—November Meteors and November Flood Traditions.

DR. OTTO HUHN.—Meteorites, Solid and Gelatinous.

PROF. PERCIVAL LOWELL.—Atmosphere in its Effects on Astronomical Observation.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, APRIL, 1897.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Absolute. Maximum. Date.	Absolute. Minimum. Temp.	Absolute. Minimum. Date.	Average. Max.	Average. Min.	Average. Dew Point.	Average. Humidity.	Absolute. Max. in Sun.	Absolute. Min. on Grass.	TotalRain. Depth.	TotalRain. Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	67·3	27	27·8	11	55·3	39·6	89·9	78	108·9	20·7	1·57	16	6·8
Malta	78·8	24	47·0	3	66·6	54·8	51·5	77	146·2	44·0	1·85	9	5·8
Mauritius	84·5	1	64·2	17	81·7	69·9	64·9	72	130·5	56·0	1·75	14	5·3
Calcutta	103·7	17	67·6	4	97·2	75·0	67·0	57	159·6	59·0	·83	4	2·7
Bombay	93·5	27	71·0	4	88·7	77·6	73·9	74	141·5	61·2	·00	0	2·0
Ceylon, Colombo	92·2	...	71·2	9	89·5	75·9	74·5	81	146·0	70·0	10·97	17	5·5
Melbourne	84·4	17	37·6	23	68·5	48·5	48·2	68	133·5	25·0	·64	7	5·0
Adelaide	90·9	4	44·7	29	74·5	54·4	48·0	57	146·0	34·7	·93	8	4·3
Sydney	88·0	12	50·8	22	74·6	59·8	54·7	71	137·8	40·6	6·06	9	3·7
Wellington	67·5	5	40·0	24	61·5	50·5	48·0	74	130·0	29·0	6·92	12	4·5
Auckland	75·0	14	45·0	19	67·3	53·4	50·2	69	138·0	42·0	2·12	9	4·3
Jamaica, Kingston	89·5	12	69·8	27	86·9	72·1	68·6	70	...	...	2·00	7	1·6
Trinidad	94·0	28*a*	65·0	11	90·3	68·7	68·6	70	169·0	63·0	·26	4	...
Grenada	86·4	22	71·0	22	84·5	74·6	72·6	83	150·6	...	2·06	13	0·9
Toronto	71·1	23	29·9	20	51·2	34·7	34·9	70	85·5	15·0	2·14	14	6·7
New Brunswick, Fredericton	70·8	25	11·7	20	49·9	28·5	30·3	65	...	...	2·67	13	6·5
Manitoba, Winnipeg	71·6	17	11·0	19	51·0	28·4	...	...	...	...	1·01	10	5·7
British Columbia, Esquimalt	70·7	15	32·2	2	56·6	40·6	45·6	83	...	...	1·04	11	5·6

a—and 29.

REMARKS.

MALTA.—Adopted mean temp. 59°·3, or 0°·3 below the average. Mean hourly velocity of wind 13·2 miles. TSS on 3rd and 10th; L on 5 days. J. F. DOBSON.

Mauritius.—Mean temp. of air 1°·0, of dew point 3°·3, and rainfall 3·47 in., below their respective averages. Mean hourly velocity of wind 12·8 miles, or 2·3 above average; extremes, 30·6 on 6th, and 1·9 on 4th; prevailing direction E.S.E. L and T on 27th. T. F. CLAXTON.

CEYLON, COLOMBO.—Thunderstorms occurred on 14 days. H. O. HARNARD.

Adelaide.—Mean temp. just the average of 40 years. This was another very dry month, the total rainfall being ·84 in. below the average. C. TODD, F.R.S.

Sydney.—Rainfall ·36 in. above, temp. 2°·3 above, and humidity 7·2 below, their respective averages. Mean temp. for the month the highest recorded since Sydney Observatory was built. H. C. RUSSELL, F.R.S.

Wellington.—Generally fine up to the 13th, with occasional showers. Wind N.W. and frequently strong. The wind changed to S.E. on night of 14th, followed by heavy rain and strong S.E. wind on 15th and 16th; 3·06 in. and 3·04 in. of rain being recorded on the 16th and 17th, causing floods. Remainder of month fine. Mean temp. 1°·0 below, and rainfall 3·39 in. above, their respective averages. R. B. GORE.

Auckland.—An unusually fine and calm month. Rainfall quite one inch below the average of 30 years; mean temperature slightly below the average. T. F. CHEESEMAN.

JAMAICA, KINGSTON.—The rainfall throughout the island shows a marked excess, and nearly every station had falls much in excess of the average. J. F. BRENNAN.

TRINIDAD.—Rainfall 1·77 in. below the average of 30 years. J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL, SEPTEMBER, 1897.

For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge (Harefield Pk.)	2·11	XI.	Rhayader, Nantgwillt ...	6·26
II.	Dorking, Abinger Hall .	2·61	,,	Lake Vyrnwy	4·90
,,	Birchington, Thor	2·01	,,	Corwen, Rhug	...
,,	Hailsham	3·82	,,	Criccieth, Talarvor	4·10
,,	Ryde, Thornbrough	2·42	,,	I. of Man, Douglas	5·44
,,	Emsworth, Redlands ...	2·74	XII.	Stoneykirk, Ardwell Ho.	4·50
,,	Alton, Ashdell	2·53	,,	New Galloway, Glenlee	4·58
III.	Oxford, Magdalen Col..	2·21	,,	Moniavie, Maxwelton Ho.	3·91
,,	Banbury, Bloxham	1·97	,,	Lilliesleaf, Riddell	2·84
,,	Northampton, Sedgebrook	2·16	XIII.	N. Esk Res. [Penicuick]	3·05
,,	Duddington [Stamford].	2·71	XIV.	Glasgow, Queen's Park..	3·39
,,	Alconbury	2·81	XV.	Inverary, Newtown	6·10
,,	Wisbech, Bank House...	3·48	,,	Oban, The Corran	...
IV.	Southend	2·54	,,	Islay, Gruinart School ...	2·82
,,	Harlow, Sheering..... ...	3·50	XVI.	Dollar.....	3·47
,,	Colchester, Lexden	2·98	,,	Balquhidder, Stronvar...	5·49
,,	Rendlesham Hall	2·34	,,	Ballinluig	...
,,	Rushall Vicarage	3·69	,,	Dalnaspidal H.R.S.....	5·49
,,	Swaffham	4·03	XVII.	Keith H.R.S.....	3·46
V.	Salisbury, Alderbury ...	2·71	,,	Forres H.R.S.	1·99
,,	Bishop's Cannings	2·50	XVIII.	Fearn, Lower Pitkerrie..	1·16
,,	Blandford, Whatcombe .	2·96	,,	N. Uist, Loch Maddy ...	...
,,	Ashburton, Holne Vic...	4·77	,,	Invergarry.....	6·30
,,	Okehampton, Oaklands.	6·31	,,	Aviemore H.R.S.	2·91
,,	Hartland Abbey	5·15	,,	Loch Ness, Drumnadrochit	4·48
,,	Lynmouth, Glenthorne.	6·69	XIX.	Invershin	3·48
,,	Probus, Lamellyn	4·67	,,	Scourie	...
,,	Wellington, The Avenue	3·24	,,	Watten H.R.S.....	3·44
,,	Wincanton.....	4·12	XX.	Dunmanway, Coolkelure	4·45
VI.	Clifton, Pembroke Road	3·82	,,	Cork, Wellesley Terrace	2·02
,,	Ross, The Graig	2·60	,,	Killarney, Woodlawn ...	3·93
,,	Wem, Clive Vicarage ...	2·05	,,	Caher, Duneske	2·87
,,	Cheadle, The Heath Ho.	3·78	,,	Ballingarry, Hazelfort...	2·76
,,	Worcester, Diglis Lock	2·12	,,	Limerick, Kilcornan ...	3·14
,,	Coventry, Priory Row ..	2·37	,,	Broadford, Hurdlestown	2·79
VII.	Grantham, Stainby	2·54	,,	Miltown Malbay	4·10
,,	Horncastle, Bucknall ...	2·43	XXI.	Gorey, Courtown House	2·50
,,	Worksop, Hodsck Priory	2·02	,,	Athlone, Twyford	2·03
VIII.	Neston, Hinderton	4·23	,,	Mullingar, Belvedere ...	2·54
,,	Southport, Hesketh Park	3·99	,,	Longford, Currygrane...	1·87
,,	Broughton-in-Furness ...	6·12	XXII.	Woodlawn	2·12
IX.	Ripon, Mickley.....	1·83	,,	Crossmolina, Enniscoe ..	3·02
,,	Melmerby, Baldersby ...	1·64	,,	Collooney, Markree Obs.	2·58
,,	Scarborough, Observat'y	3·09	,,	Ballinamore, Lawderdale	1·89
,,	Middleton, Mickleton ...	2·78	XXIII.	Warrenpoint.....	2·52
X.	Haltwhistle, Unthank...	...	,,	Seaforde.....	2·57
,,	Bamburgh.....	2·20	,,	Belfast, Springfield	2·92
,,	Keswick, The Bank.....	6·16	,,	Bushmills, Dundarave..	2·86
XI.	Llanfrechfa Grange	5·02	,,	Stewartstown	1·40
,,	Llandovery	4·99	,,	Killybegs	4·96
,,	Castle Malgwyn	4·81	,,	Lough Swilly, Carrablagh	4·14
,,	Builth, Abergwesyn Vic.	7·42			

SEPTEMBER, 1897.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Date	Min. Deg.	Date.	No. of Nights below 32°. In shade.	On grass.
			inches.	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	2·75	+ ·24	·68	29	13	70·6	29	38·1	19	0	0
II.		Tenterden	2·43	— ·48	·55	29	16	70·0	26	37·0	19	0	...
,,		Strathfieldsaye	1·32	...	·45	1	11	...	...	...	...	...	...
III.		Hitchin	1·90	— ·60	·49	1	13	67·0	11*a*	36·0	9	0	...
,,		Winslow (Addington)	3·33	+ ·66	1·99	29	13	68·0	2*a*	33·0	19	0	1
IV.		Bury St. Edmunds (Westley)	2·93	+ ·23	·73	29	14	65·0	26	38·0	19	0	..
,,		Norwich (Brundall)	3·94	...	·92	18	16	69·0	2	39·0	4	0	0
V.		Weymouth(LangtonHerring)	...	...	...	...	...	...	...	...	...	...	...
,,		Torquay (Cary Green)	3·09	...	·84	8	15	66·5	21	42·0	19	0	0
,,		Polapit Tamar [Launceston]..	6·03	+ 2·32	1·38	8	20	68·5	14	36·8	12*e*	0	...
VI.		Stroud (Upfield)	2·69	— ·22	·77	29	14	67·0	15*b*	40·0	18	0	...
,,		ChurchStretton(Woolstaston)	2·49	— ·01	·48	5	17	68·0	28	38·0	10	0	1
,,		Tenbury (Orleton)	...	...	...	...	...	...	...	...	...	...	...
VII.		Leicester (Rotherby Hall) ...	2·35	...	·45	5	22	66·0	12*c*	34·0	19	0	7
,,		Boston	3·12	+ ·35	1·08	29	12	70·0	12	34·0	19	0	...
,,		Hesley Hall [Tickhill].....	1·99	— ·17	·49	1	13	69·0	24	36·0	9, 12	0	...
VIII.		Manchester(PlymouthGrove)	4·01	+ ·54	·91	2	12	69·0	27	34·0	9, 18	0	3
IX.		Wetherby (Ribston Hall) ...	2·65	+ ·19	·45	1	14	...	...	...	...	...	...
,,		Skipton (Arncliffe)	6·42	+ 1·66	1·22	1	18	...	...	...	...	...	...
,,		Hull (Pearson Park).	3·21	+ ·77	·67	29	14	69·0	24	35·0	9	0	...
X.		Newcastle (Town Moor)	2·75	— ·03	·80	1	13	...	...	...	...	...	...
,,		Borrowdale (Seathwaite).....	11·99	+ ·26	3·42	23	18	...	...	...	...	...	...
XI.	WALES.	Cardiff (Ely).....	5·91	+ 2·17	1·37	29	13	...	...	...	...	...	...
,,		Haverfordwest	5·09	+ ·69	1·04	1	20	66·9	12	36·2	12	0	3
,,		Aberystwith (Gogerddan) ...	7·20	+ 2·93	1·25	4	19	67·0	27	28·0	9*f*	...	...
,,		Llandudno.....	3·62	+ 1·40	1·00	1	17	66·2	14	39·0	10	0	...
XII.	SCOTLAND.	Cargen [Dumfries]	3·40	— ·16	·66	1	16	71·6	13	34·0	9	0	...
XIII.		Edinburgh (Blacket Place)...	1·64	...	·33	1	20	69·1	13	38·0	18*e*	0	0
XIV.		Colmonell	3·90	...	·90	1	17	72·0	13	30·0	9	...	...
XV.		Lochgilphead (Kilmory).....	6·30	+ 1·17	·90	16	19	...	...	35·0	7	0	...
,,		Mull (Quinish).....	5·84	+ ·81	1·18	3	22	...	...	...	...	...	...
XVI.		Loch Leven Sluices	3·00	+ ·21	·70	2	15	...	...	...	...	...	..
,,		Dundee (Eastern Necropolis)	1·25	— 1·26	·25	1	17	70·4	12	35·3	7	0	...
XVII.		Braemar	1·78	— 1·08	·44	1	21	64·2	13	28·5	8	3	15
,,		Aberdeen (Cranford)	1·52	...	·43	29	22	71·0	12*d*	32·0	3	1	...
,,		Cawdor (Budgate)	2·49	— ·26	·39	1	25	...	...	...	...	...	...
XVIII		Strathconan [Beauly]	5·42	+ 1·74	1·94	27	12	...	...	...	...	...	...
,,		Glencarron Lodge.....	11·21	...	2·15	25	24	64·2	13	33·6	9	0	...
XIX.		Dunrobin	...	...	...	...	...	...	...	...	...	...	...
,,		S. Ronaldsay (Roeberry).....	5·99	+ 3·33	2·25	29	24	60·0	14	41·0	17	0	...
XX.	IRELAND.	Darrynane Abbey.....	2·99	...	·90	7	18	...	...	...	...	...	...
,,		Waterford (Brook Lodge) ...	3·29	+ ·37	1·43	1	12	72·0	14	37·0	12	0	...
,,		O'Briensbridge (Ross)	3·31	...	·49	4	16	...	...	...	...	...	...
XXI.		Carlow (Browne's Hill)	3·19	+ ·37	1·24	1	17	...	...	...	...	...	...
,,		Dublin (FitzWilliam Square)	2·58	+ ·61	1·17	1	16	67·7	23	40·9	18	0	0
XXII.		Ballinasloe	2·15	— ·64	·56	4	18	65·0	13*d*	38·0	12	0	...
,,		Clifden (Kylemore)	5·44	...	1·56	4	18	...	...	...	...	...	...
XXIII		Waringstown	2·21	— ·95	·61	1	15	73·0	13	34·0	9	0	7
,,		Londonderry (Creggan Res.).	2·60	— 1·18	·30	4	24	...	...	...	...	...	...
,,		Omagh (Edenfel).....	2·27	— 1·11	·47	5	21	66·0	13	35·0	9	0	...

+ Shows that the fall was above the average ; — that it was below it.

a—and 13, 26. *b*—and 27. *c*—and 26, 27. *d*—and 14. *e*—and 19. *f*—and 10, 11, 18.

METEOROLOGICAL NOTES ON SEPTEMBER, 1897.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

TENTERDEN.—The 1st and 5th were rough and wet, and the 2nd, 4th, 19th, 23rd and 24th were also windy. Fine weather prevailed in the middle of the month and there were two or three lovely days towards the end. Duration of sunshine 140 hours. T on 17th; TS at night on 29th.

ADDINGTON.—A good deal of very fine weather during the month. Rather wet until the 5th, after that date very little R until the evening of the 29th, when a very heavy storm of R, T, and L occurred, 1·99 in. of R falling, mostly between 4 p.m. and 8.30 p.m. For a long time the lightning was almost continuous in the S.E. On 30th, the brook overflowed the meadows. A slight frost on the 19th blackened a few tender things in low situations. Fogs on 27th and 30th.

BURY ST. EDMUNDS, WESTLEY.—A month of the usual September weather. Cold days from 17th to 20th, the max. temp. on 19th being only 49°. Heavy TS at night on 29th, with incessant L, and very high wind.

NORWICH, BRUNDALL.—Mean temp. 2° below, and R 1·28 in. above, the average, and ·31 in. in excess of September, 1896, but the number of rainy days was 16 against 21 in the previous year. S.W. gale on 2nd. L on 3rd and 29th. TS and H showers on 4th. T and L on 6th, T, L, and heavy R on 29th.

TORQUAY, CARY GREEN.—Rainfall ·70 in. above the average. Mean temp. 56°·1, or 1°·9 below the average. Duration of sunshine 156 hours 35 minutes, being 1 hour 15 minutes above the average; four sunless days.

POLAPIT TAMAR.—A very wet month, especially the first eight days; the first few days were also rather stormy. The middle and latter portions of the month were generally calm and fine. The total rainfall for the first nine months of the year exceeds the whole fall for the year 1896. T and H on 3rd.

WOOLSTASTON.—The early part of the month was cold and wet, the latter part warmer and more genial. Mean temp. 54°·9. Vivid L on 29th.

ROTHERBY HALL.—The weather during the month was mild, with a fair amount of sunshine, the R falling chiefly in the night. The little frost (the thermometer on the grass falling once to 23°) did only slight damage to the gardens. The rainfall was ·24 in. below the average for ten years, 1880-89. Mean. temp. in shade 52°.

HULL, PEARSON PARK.—TSS on 1st and 6th.

SEATHWAITE.—On 23rd and 24th, 4·86 in. of R fell, causing a flood on the latter date.

WALES.

HAVERFORDWEST.—There were 20 wet days this September, but it was neither so wet nor so stormy as last year, although during the first six days strong winds prevailed with low pressure, and much R. Between the 9th and 18th there was fine bright weather, with a great fall of night temp. from the 10th to the 13th, the grass readings on three nights being below 32°. The unusual number of rainy days seriously interfered with the late harvest, and it is feared that much corn has been spoiled.

SCOTLAND.

CARGEN [DUMFRIES].—A cold, although on the whole not ungenial month. Barometrical pressure and hours of sunshine are both slightly above the average for 38 years. The mean temp. is 1°·9 below that average. In the first six days 1·84 in. of R fell, considerably more than half the total for the month. Seven exceptionally fine days, 7th—13th, were followed by broken weather during the remainder of the month, and although R was recorded on ten out of the remaining seventeen days, no heavy fall (except ·46 in. on 23rd) occurred, and sharp breezes, chiefly westerly, prevented very serious interference with harvest operations, which, except in the higher districts, were concluded before the end of the month. The grain crop proved fairly satisfactory.

COLMONELL.—R ·12 in. below, and mean temp. 1°·3 above, the average of 21 years.

ABERDEEN, CRANFORD.—A warm month, with light winds.

S. RONALDSAY, ROEBERRY.—A wet month. Mean temp. 50°·5, or 1°·1 below the average of 7 years.

IRELAND.

WATERFORD, BROOK LODGE.—Dense fog on 11th, thick fog on 15th, and fogs on 12th and 13th. T in the afternoon on 30th.

O'BRIENSBRIDGE, ROSS.—Moderate R and a fortnight of bright weather.

DUBLIN, FITZWILLIAM SQUARE.—The month began badly, but proved favourable after the first few days, which were cold and wet. The mean temp. 54°·5 is 1°·3 below the average. High winds were noted on 11 days, but attained the force of a gale only on the 23rd. The atmosphere was foggy on 6 days. H fell on 3 days. A solar halo was seen on the 7th.

WARINGSTOWN.—An unusual difference was observed between the minima in shade, and on grass, amounting on the night of the 7th, 8th, 10th, 11th, and 18th, to 10°, while on the night of the 9th the shade min. was 34°, and the grass min. 25°. French beans, and some other plants were injured, but dahlias and heliotrope did not suffer.

EDENFEL.—The weather of September, although on the whole fickle and uncertain, tended to retrieve the disaster that impended over the harvest generally, and it would be impossible to over estimate the value to the country of the fineness of the second and part of the last week. As a result an average crop of cereals was saved in fair order, and the deficiency of potatoes—very serious in some localities—has been to some extent compensated for by the abundance of other green crops and grass. Orchard fruit is the worst crop remembered.